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CHINESE TYPE PRODUCTION TECHNIQUES DEVELOPED BY WATCH INDUSTRY

Advanced Standards of World and Chinese Standard Time

A margin of error in Peking time announced over radio stations of China is normally less than 1-10 to 1-100 and the accuracy of Chinese standard time measured by the Chinese timing system is less than 2 seconds to 1,000 minutes, which is considered a par with international standard.

This highly accurate time is broadcast throughout China and to foreign countries by the Shanghai Observatory, which coordinates and revises data received and gathered by the Shanghai Observatory, Nanking Tzu-chin^{shan}/Observatory, Peiping Observatory and the Survey and Geo-physical Institute of the Wuhan Academy of Sciences. The Chinese timing device was endorsed officially at Peiping in 1965 as one of the world's best.

In 1872, a Frenchman built an observatory at Hsu-chia-hui in Shanghai, but this was used principally to service foreign battleships and commercial ships. Researchers at the time were all foreigners and the precision in measuring time was very low. A new set of time measuring equipment was established at Shanghai Observatory and at Nanking Tzu-chin-shan Observatory after the liberation. The Shanghai Observatory began gathering data from both observatories and started to issue its own standard time from 1959. Time measuring facilities were completed at Peiping and Wuhan in 1961 and 1963 respectively.

China developed one of the most accurate standard time system. China also has made progress in making watches come up to the world standard.

Watches from Imported to Home Products

All watches worn by the Chinese or shown in show windows during the olden days were foreign products. Chinese were not only incapable of making watches but had to import parts and even oil for watch repairs. The Chung-kue Watch Plant in Shanghai once manufactured table watches known as Brand "35", but springs, steel plates and copper plates had to be imported. Tools needed for the manufacture of watches had to be imported also.

In the early days of New China, only 4 or 5 types of watches were being manufactured, but since 1962, table clocks, wall clocks, alarm clocks, electric watches, clocks for automobiles and battery operated clocks started to appear. In addition, 40 different types of 8 day clock, watches for ping pong, watches for shogi (Chinese chess), electronic watches, wrist watches for men and women, para-shock watches, calendar watches and pocket watches for blinds are being produced.

85% of Production Allocated to Alarm Clocks of Unified Specifications

In 1958, a design and a test manufacture of large clocks and alarm clocks of uniform specifications started. Since the policy of starting with large clocks and work toward medium class and then to high class watches was initiated, the progress made in watch making has been good. Watch plants decided to produce 85% in ordinary alarm clocks of uniform specifications to meet the demand of city and rural population. About 10% is allocated for table and wall clocks for farmers. Only a small number of plants have been designated to manufacture watches so that techniques and quality can be improved. All parts used have been standardized.

Various watch plants strengthened their research and design activities. In 1964, about 30 new products of over 100 different designs were produced. These

are all "chic" and durable. Cases are mostly of steel but plastic has been used in some instances. They vary in shapes and the plastic watches come in various colors as well. Watches in bamboo, wooden and precious stone cases have been produced through requests.

Alarm Clock of International Level

Several watch factories have produced good results in research on high level products. For example, eight day 15 jewel alarm clocks manufactured by Shanghai Pei-kae Watch Plant, kitchen use clocks manufactured by Ta-kuang-ming Watch Plant and 15 day 13 jewel large clocks produced by Yen-t'ai Watch Plant not only show good design but improved in longevity and accuracy.

The Yen-t'ai Watch Plant, which possesses a long history of 51 years of watch making, produced only a few types of alarm clocks but during half a year from 1963 to 1964, the plant produced 100 types of new alarms clocks distributed to 21 provinces and districts.

In 1963, China converted phosphor bronze hair springs used in other countries for alarm clocks to superior alloy hair springs to improve the accuracy. Clocks using this type of spring are well received and are being exported to over 50 countries including the countries well advanced in watch making. In 1963, a British importing firm had an expert check on the "Diamond" brand watches made in Shanghai and the result showed that the quality was on equal level with the Swiss products. A certificate of this examination was forwarded to China.

The well known "35" wall clocks adopted a new technique and became a 30 day clock since 1965. A degree of accuracy is within 30 seconds a day and will run for 40 days on a single winding.

Wrist Watch Plant Established in Shanghai

With the increase in demand for wrist watches by locomotive engineers, technicians, scientists, doctors, teachers and workers and with the improvement in production techniques for wrist watches, a greater effort is now being placed in the production of wrist watches.

In 1955, a watch repairman in Shanghai handcrafted 18 watches with an aid from an authority concerned. This was the beginning of wrist watch making in China. In the following year of 1956, a man's three hands [probably means with sweeping second hand] wrist watch was first manufactured at both Shanghai and Tientsin. The Shanghai Wrist Watch Plant was established during the same year and the production began in the last quarter of 1958. Over 80% of the facilities used in this plant are domestic products. Para-shock watches were mass produced from 1961 and the women's three hands 17 jewels water proof watches started to appear at this time. By the end of 1965, several million pieces of various types of "Shanghai" brand watches have been manufactured. This "Shanghai" brand is not only well designed but the quality is very good.

Chinese Style Wrist Watch Production Techniques Developed

CH'U T'ing-tse, a former Captain of Chiang Kai-shek's Air Force and now a deputy division commander of a Chinese People's Air Force, visited the Shanghai Wrist Watch Plant and stated: "After I decided and returned to fatherland from Taiwan, I bought a Shanghai brand wrist watch for my younger brother. I checked each morning for about a month and found that the Shanghai brand was much more accurate than the foreign made aeronautical watch purchased in Taiwan." However,

there is an untold difficulties behind this. In the beginning, there were no technical materials, facilities and technicians. Foreign countries were willing to sell ordinary machineries but not even advertisement on precision watch making machineries was shown to the Chinese. Therefore, the Chinese developed their own precision machines gradually with the strong support of the government and with the close cooperation of the scientific organs concerned. They also developed technicians for watch making and at the same time developed the Chinese style of wrist watch making techniques.

Hair Spring and Jewel Bearing--Two Obstacles in Wrist Watch Making

All 154 parts including the hair spring, jewel bearings and main springs of the Shanghai brand wrist watches are domestically produced. Foreign visitors from various countries of the Five Continents who visited the Shanghai Wrist Watch Plant have expressed their admiration. One French person said: "The fate of China's wrist watch making is entirely in your hands. This is rarely seen in other countries." Members of the Swiss Watch Society were amazed at the speed of advancement made in watch making. They said: "Swiss has been making watches for two to three hundred years but it is amazing that China has reached such a high standard in only 10 years."

Wrist watches require most delicate work among all watches. They require highly precisioned facilities and processing techniques, especially in the making of hair springs and jewel bearings. A smallest jewel bearing is about 1/350 of a rice grain and as hard as a diamond requiring mirror like polishing. Its margin of error can not exceed more than 1 micron. Hair springs are made

drawn out from a club like steel billet [or bloom] and must possess good elasticity and the margin of error in thickness cannot exceed 1 micron. Therefore, these two parts are the keys to wrist watch making industry of China.

Shanghai Watch Parts Plant Established by Consolidating Small Plants

In 1961, the Kuan-lo -ming Fountain Pen Plant joined with "Ching-yun" and "Ta-ming" plants, which test produced hair springs and jewel bearings at one time, and changed its name to Shanghai Watch Parts Plant to continue with the manufacture of hair springs and jewel bearings. During this time, no technicians and technical materials of value were available. Facilities were very crude. A foreign visitor to the plant just shook his head and said: "Facilities are so bad that these may not be suitable for high precision products," and proposed that Chinese should be despatched to foreign countries to investigate foreign techniques and facilities. However, the Chinese delegation were not permitted to investigate hair spring and jewel bearing shops on their tour. The Chinese decided to go on their own.

Hair Springs Developed After Several Hundred Tests

Many difficulties were encountered in drawing thin springs from rolled steel. Sometimes the steel ingots would shatter while being forged, rolled steel would crack or lose elasticity or break after being drawn into a thin strips, but they finally succeeded in producing hair springs which met the required specifications. However, when the springs were sent to wristwatch making

factories, 70% were rejected. An engineer pondered for a while and said: "Steel used for hair springs may be one type of a steel alloy with transformation characteristic. The use of hands may cause the transformation." The workers realized then that all processes had to be automated. The plant chief, however, encouraged the workers by saying, "A rejection of hair springs by 70% does not matter. The fact that 30% were accepted is a great victory when these were manufactured from obsolete facilities."

Ling Fu-ken, one of the workers of the plant, started on a research. While working at the steel making furnace at night, he noticed within the furnace that one part burn with whitish flames and other part with reddish flames. He thought that the burning temperature at the throat and around the furnace and ^{at} the center part was different which may have caused the quality difference in hair springs. An actual test proved that he was right.

The plant tested with 48 different compositions of materials, carried out 165 different refining processes and 330 tests for drawing out, rolling and forming before hair springs were successfully test manufactured.

Succeeded in Producing Own Bearing Making Facilities

Test manufacture of jewel bearings was more difficult. The workers carried out over 15,300 tests, used 593 different methods, studied various techniques and solved 68 key points before succeeding in test manufacture of jewel bearings for 17 jewel wrist watches of four different types and ten specifications.

Thus, after two years of struggles, China's first hair springs and jewel

bearings for wrist watches were born. The plant has a capability of producing several ~~ten thousands~~^{of} hair springs and several ~~ten thousands~~^{of} jewel bearing sets annually. The quality of these products is on equal level with the international standards.

A watch material plant was established also in Nanking in September 1964. A first phase of this plant has been almost completed and a test run of the bearing making processes has begun. This plant was officially started in March 1960 to manufacture bearings and springs for watches, to process copper and steel and to repair watches. A double shaft grinder made by the Shanghai No.7 Machine Tool Plant is used in grinding bearings. The quality is good but the margin of error of these bearings is about 2 micron.

Synthetic facilities for artificial jewels have been mass produced at the No.7 Machine Tool Plant since 1961. This plant also manufactures processing facility, which is made up of nine machines, for specialized processing of artificial jewels for wrist watches and instruments.

An electronic watch calibrator to measure cadence of a watch was successfully test produced in 1964 at the Nanking Tzu-chin-shan Watch Plant. A small amount started to appear from the following year. The appearance of this equipment eliminated the great inconveniences encountered previously of relying on small number of foreign products.